

Monitoring Groundwater and Surface Water and Source Water Program



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Environmental Assistance Conference

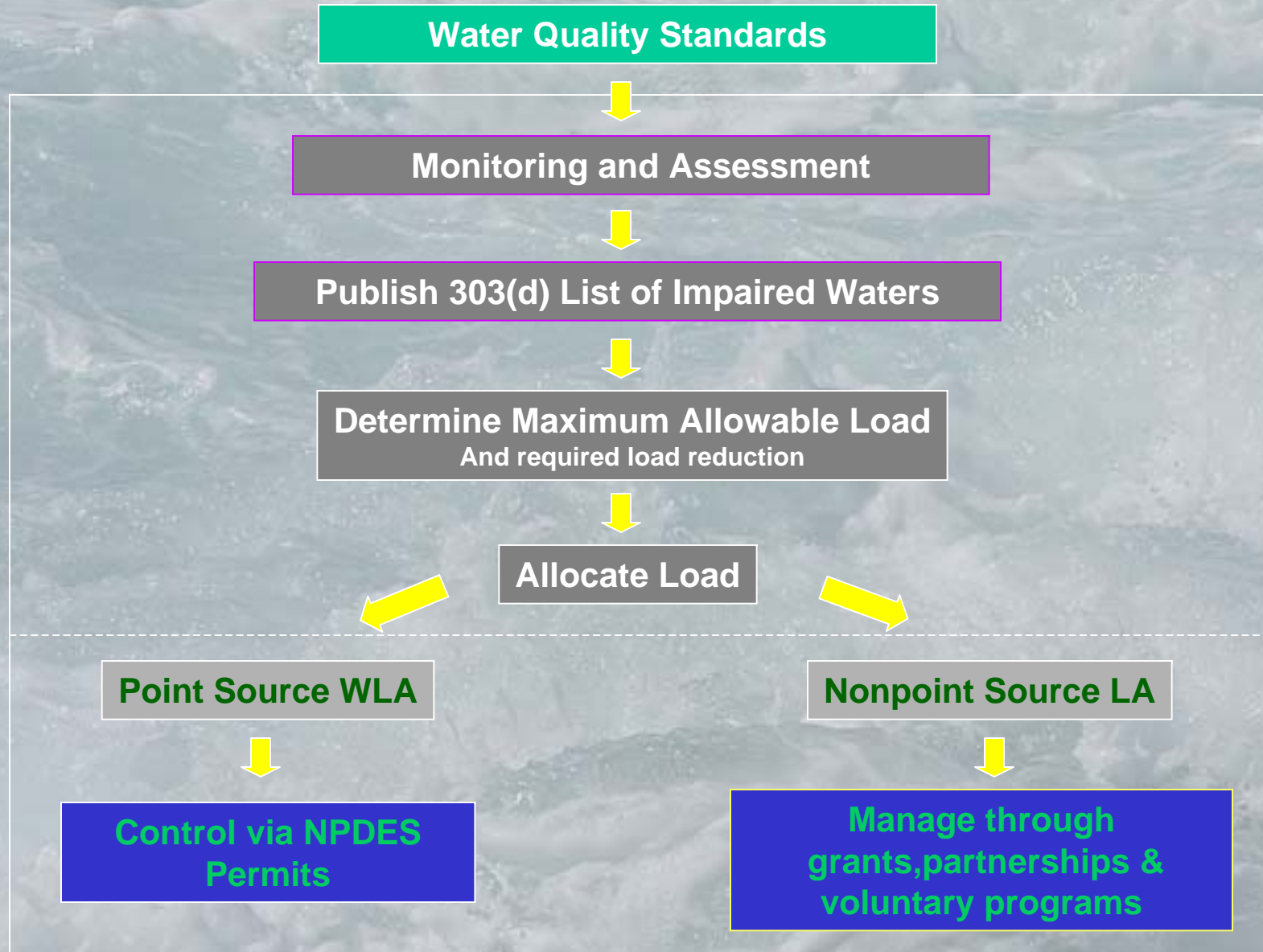
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Ambient Surface Water Monitoring Program

Purpose of the Ambient Water Quality Monitoring Program

- **The collection and analysis of data needed to make water quality management decisions:**
 - Determine water quality status & identify waters not supporting classified uses (§305(b), §303(d), WWQA)
 - Determine long-term trends in concentrations of various constituents at individual sites (WWQA)
 - Collect data for Wasteload Allocation Models
 - Support specific NPDES permit limits
 - Evaluate effectiveness of SCDHEC programs

TMDLs and the Clean Water Act



Main Ambient Monitoring Activities

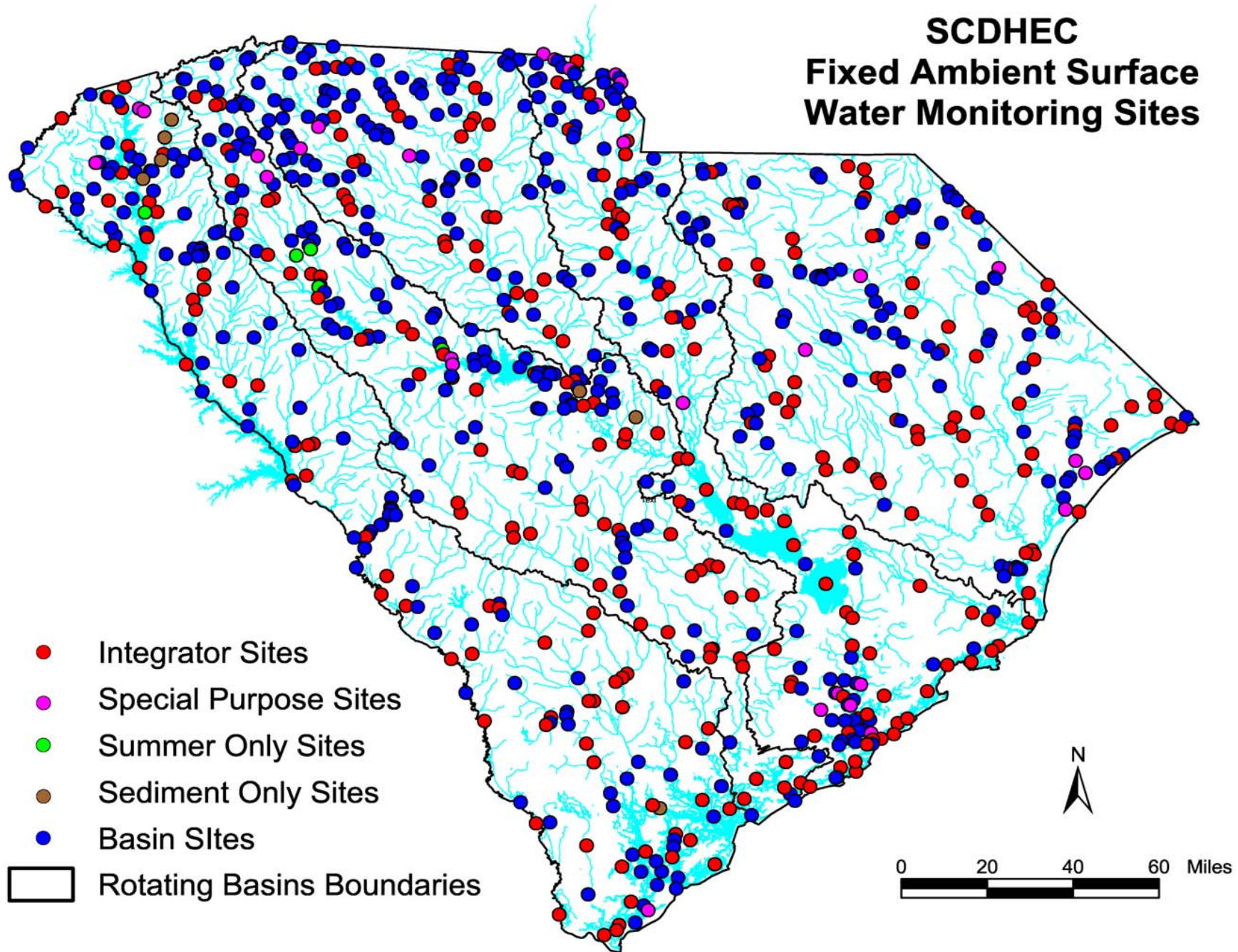
- **Physical & Chemical Monitoring**
 - Water Column
 - Sediment
- **Biological Community Monitoring**
 - Macroinvertebrate
- **Fish Tissue Monitoring**

Components of the Ambient Monitoring Network Design

- **Fixed Monitoring Network**
 - Long-term trends
 - Consistent statewide coverage
- **Cyclical Basin Monitoring**
 - More spatially dense coverage
 - Watershed focus
- **Probability-Based Monitoring**
 - Statistical survey of statewide resources
 - Sample new locations



SCDHEC Fixed Ambient Surface Water Monitoring Sites



Most BOW programs are organized around a cyclical watershed approach

- **Year One**
 - Additional ambient monitoring
- **Year Two**
 - Assessment of WQ status (5 years of available data) & trends (up to 15 years)
 - Wasteload allocation modeling
- **Year Three**
 - Permit issuance
- **Continuously - Implementation**

SCDHEC Major Program Basins

SCDHEC Major Basins



0 30 60 Miles



Cyclic Basin Sites

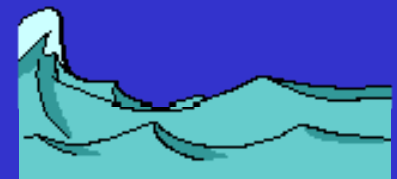
- More-or-less fixed, on a 5 year cycle
- Sampled monthly for 1 year when active

Watershed Program's Five-year Rotating Basin Schedule

	Savannah and Salkehatchie	Saluda and Edisto	Catawba and Santee	Pee Dee	Broad
2006	Assessment, Reporting	Monitoring	Remediation	Permitting*	Wasteload Allocation
2007	Wasteload Allocation	Assessment, Reporting	Monitoring	Remediation	Permitting*
2008	Permitting*	Wasteload Allocation	Assessment, Reporting	Monitoring	Remediation
2009	Remediation	Permitting*	Wasteload Allocation	Assessment, Reporting	Monitoring
2010	Monitoring	Remediation	Permitting*	Wasteload Allocation	Assessment, Reporting

Probability-Based Component

- **Probability Sites**
 - Sampled monthly for 1 year
- **Make comprehensive statements about statewide WQ conditions (§305(b) use support)**
 - Unbiased random sample (survey) of water resources
 - Represents entire resource
 - Known confidence of condition estimates
- **Sample previously unsampled locations**
 - Identify new §303(d) candidates



Resource Types Assessed Using Probability-Based Approach

- **Streams (30 locations)**
- **Lakes (30 locations)**
- **Estuaries (30 locations)**

Primary Uses to be Assessed with Probability Data

- **Statewide**
 - Aquatic Life Use Support
 - Recreational Use Support

Indicators

Core Parameters - All Physical & Chemical Sites

Monthly

Air & Water Temp

Total Phosphorus

Dissolved Oxygen

Kjeldahl Nitrogen

pH

Nitrate

BOD₅

Ammonia

Fecal Coliform

Alkalinity

Bacteria

Turbidity

Core Parameters - All Physical & Chemical Sites

Quarterly

Total Organic Carbon Manganese

Cadmium Mercury

Chromium Nickel

Copper Zinc

Iron Annually

Lead Hardness*

*Freshwater sites only

Core Parameters - Waterbody-Type Specific

Monthly

Salinity
Conductivity } Saltwater sites only
Chlorophyll a (May-Oct. all lakes and select estuarine)
Transparency (Secchi depth, all lakes)

Sediment Sampling

Annually

- Probability-based sites
 - All 30 streams and 30 lakes sampled and analyzed by SCDHEC
 - All estuarine sites collected by SCDNR and analyzed by NOAA – NOS
- 86 Fixed-location sites
- Select basin sites each year

Sediment Analyses at Selected Monitoring Sites

Annually – all sediment sampling sites

Total Phosphorus

Total Kjeldahl Nitrogen

Percent Volatile Solids

Metals

Pesticide & PCB Scan (25 compounds)

Additional Sediment Analyses at Selected Monitoring Sites

Annually

BNA Extractable Organics Scan

(56 compounds)

Volatile Organics Scan

(31 compounds)

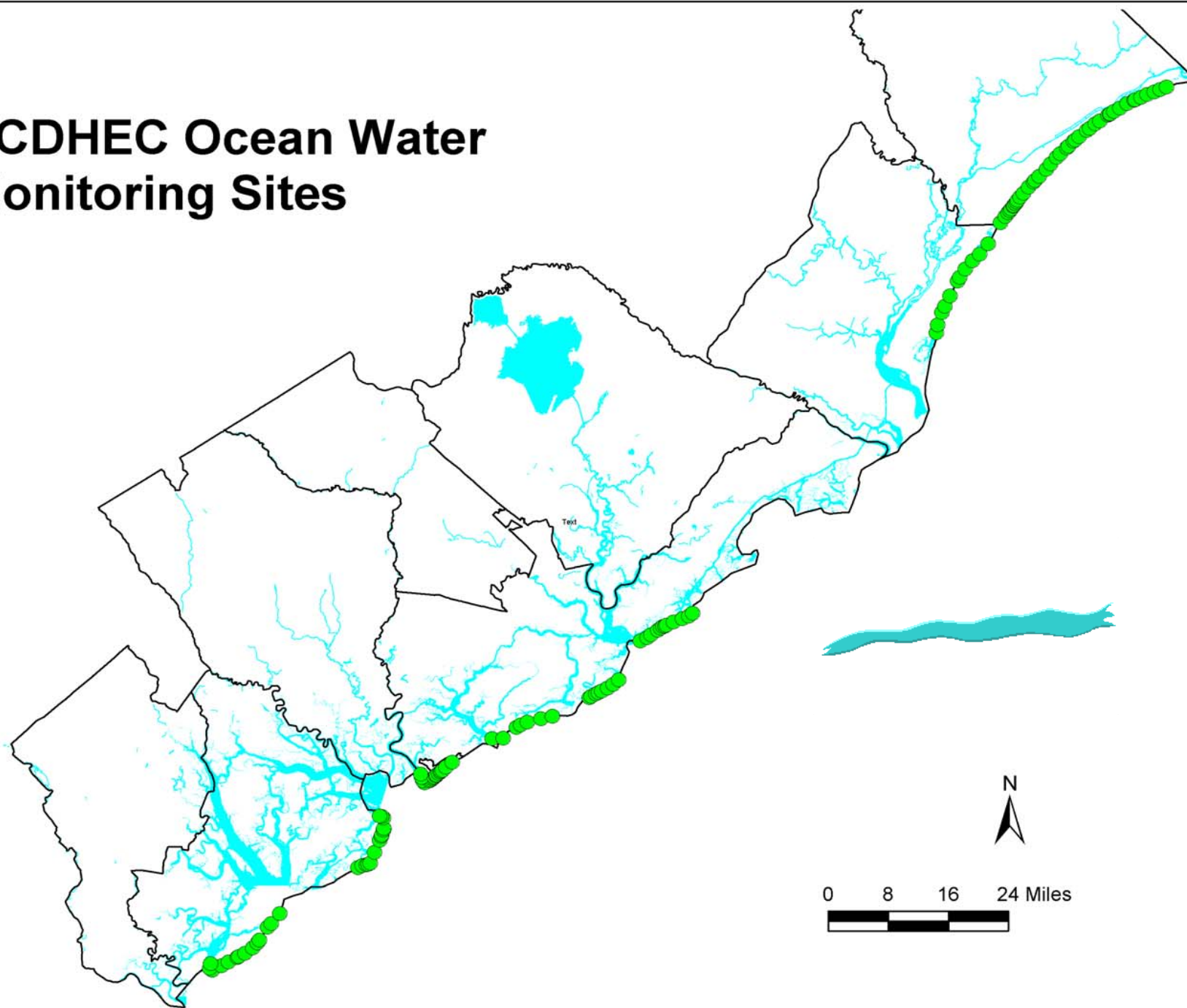
Other Monitoring Elements

Ocean Water Monitoring

- 118 fixed sites coast wide sampled
May 15 thru October 15
 - 40 Sampled weekly
 - 78 Sampled twice per month
- Used to issue swimming advisories at coastal beaches



SCDHEC Ocean Water Monitoring Sites



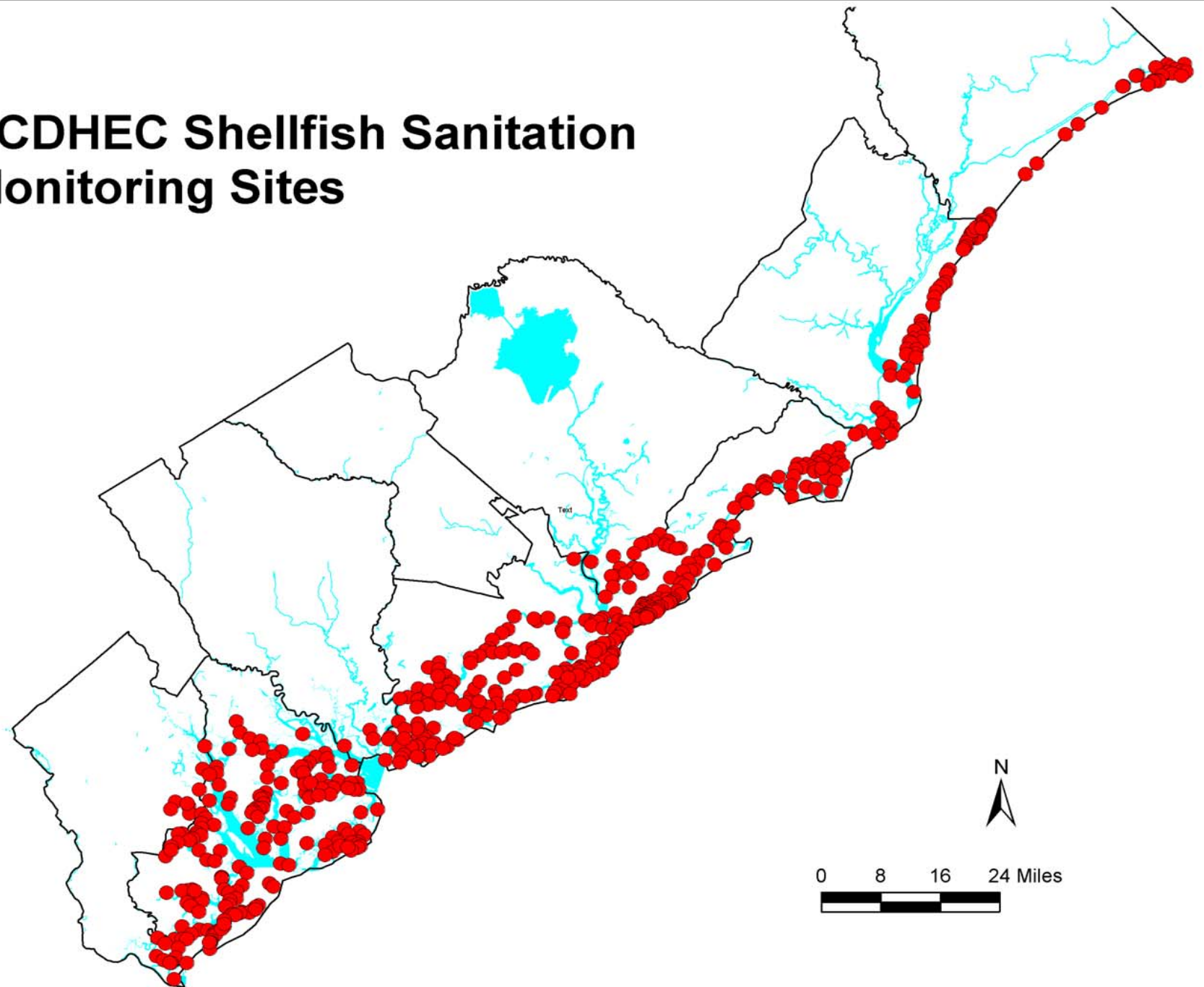
Shellfish Sanitation Monitoring

- Statewide fixed sites
 - 467 sites sampled monthly



- Used to determine shellfish harvesting status

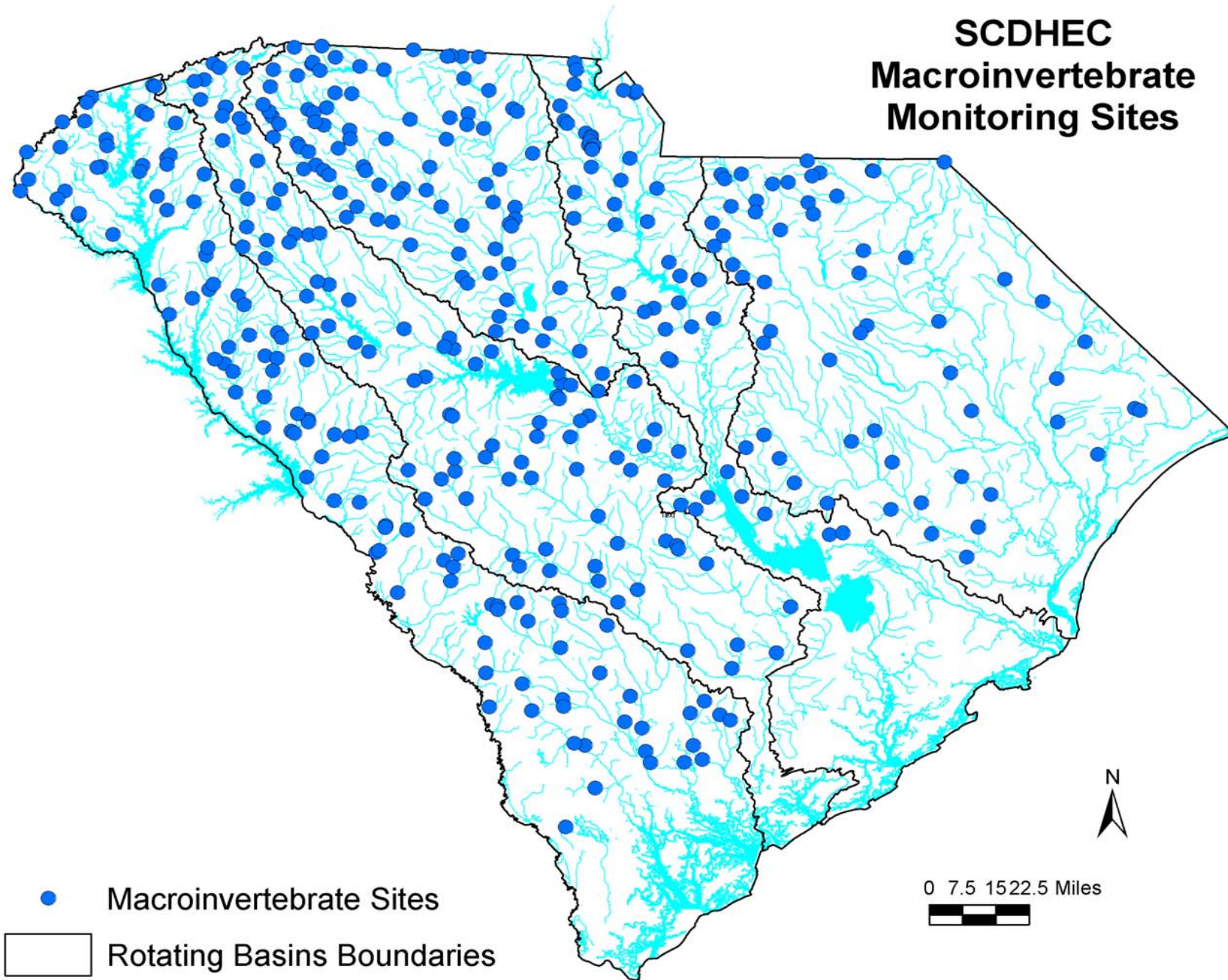
SCDHEC Shellfish Sanitation Monitoring Sites



Macroinvertebrate Monitoring

- Basin sites
 - Approximately 80 per year
 - Includes reference sites within basin
- Probability-based stream sites
 - Wadeable stream sites, up to 30 per year
- Habitat & community assessment at all sites

SCDHEC Macroinvertebrate Monitoring Sites



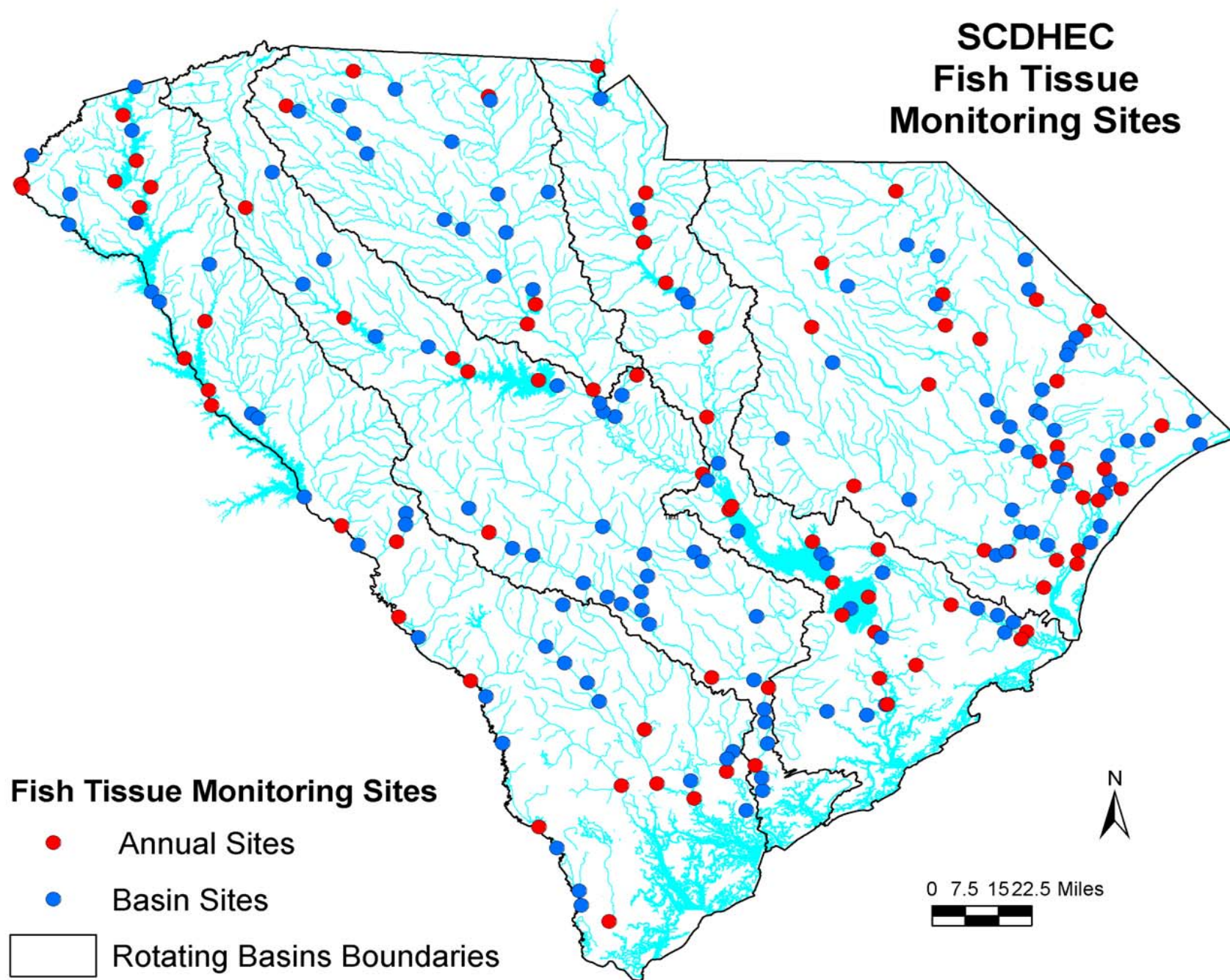
Fish Tissue Monitoring

- Statewide fixed sites
 - 87 sites visited annually
- Basin sites
 - 14 – 42 additional sites annually, depending on basin

Fish Tissue Monitoring

- At least 2 species per site
 - May include additional species based on frequency of occurrence
- 5 Individuals per species
- Each individual treated as a separate sample
- Mercury on each sample (individual)
- 12 Samples per month for additional metals

SCDHEC Fish Tissue Monitoring Sites



You Need to Have a Little of Everything

- Probability based for big picture statements
- Fixed sites to examine long-term trends in individual parameters
- Capability for targeted monitoring for specific needs:
 - Emerging issues/special studies
 - Tracking of implementation of control strategies

Groundwater Water Monitoring

Quantity

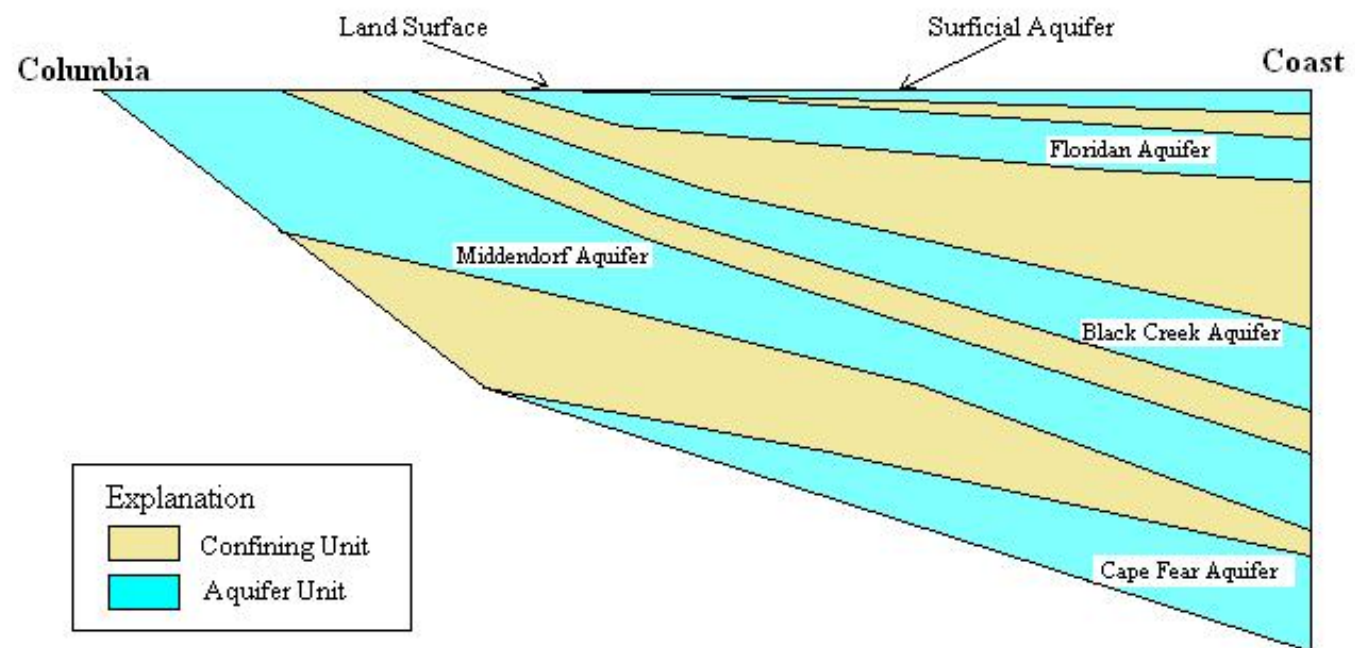
- Wells and water level data mainly in coastal plain

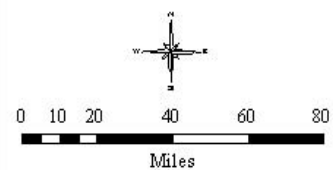
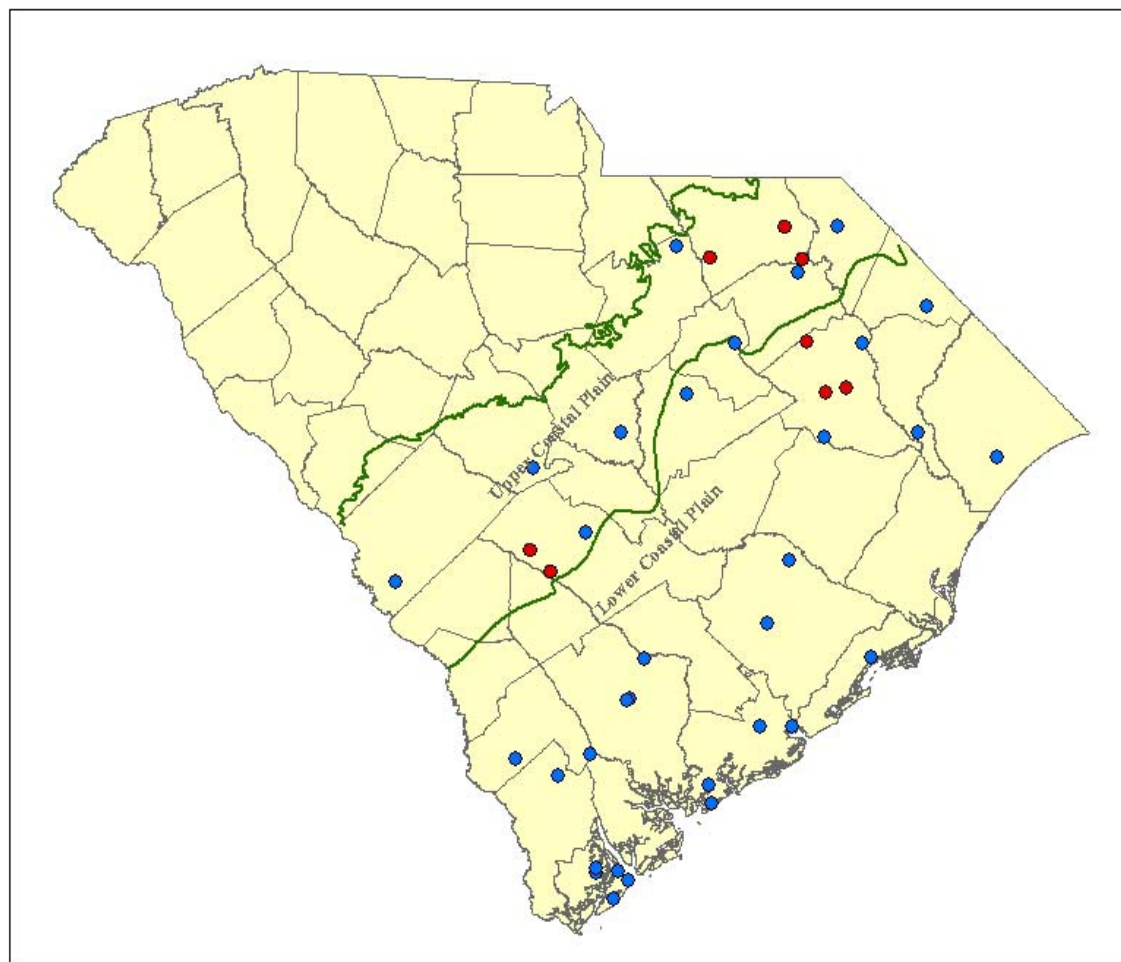
Quality

- Ambient groundwater sampling program
- Site-specific contamination investigations

Groundwater Quantity



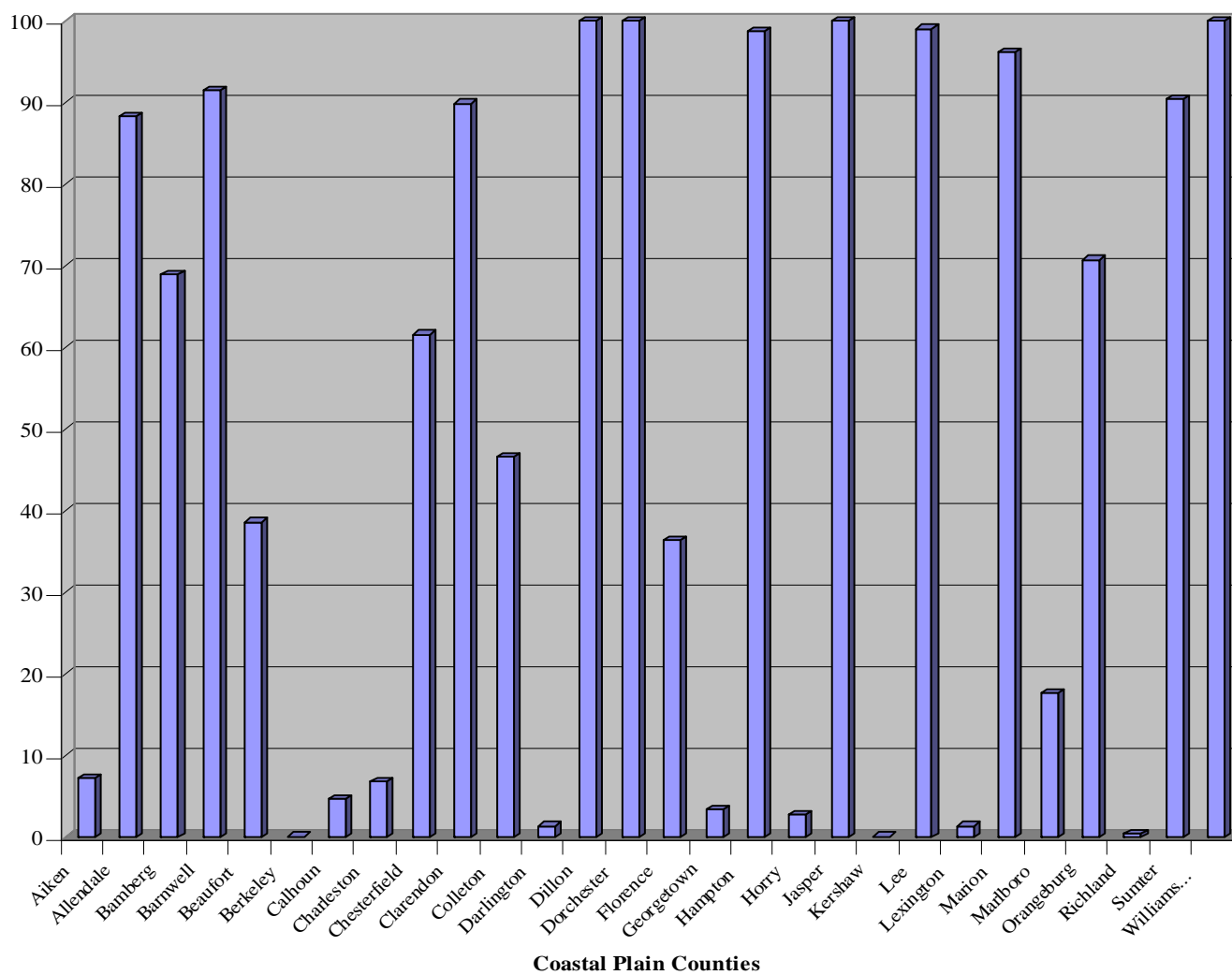




Legend

- SCDHEC Water Level Monitoring Wells
- SC DNR Water Level Monitoring Wells
- Physiographic Boundaries
- Counties

Percentage of Total Water Used From Groundwater



Groundwater Resources in the SC Coastal Plain

- Three aquifers in the Coastal Plain are the primary sources for groundwater use (Middendorf, Black Creek and the Floridan Aquifers)
- Working with SCDNR on Coastal Plain water level monitoring network for major aquifers.
- The Department expanding this network to have more than 70 locations with automatic data recorders.
- Support Capacity Use Program – Area Designations and Permitting

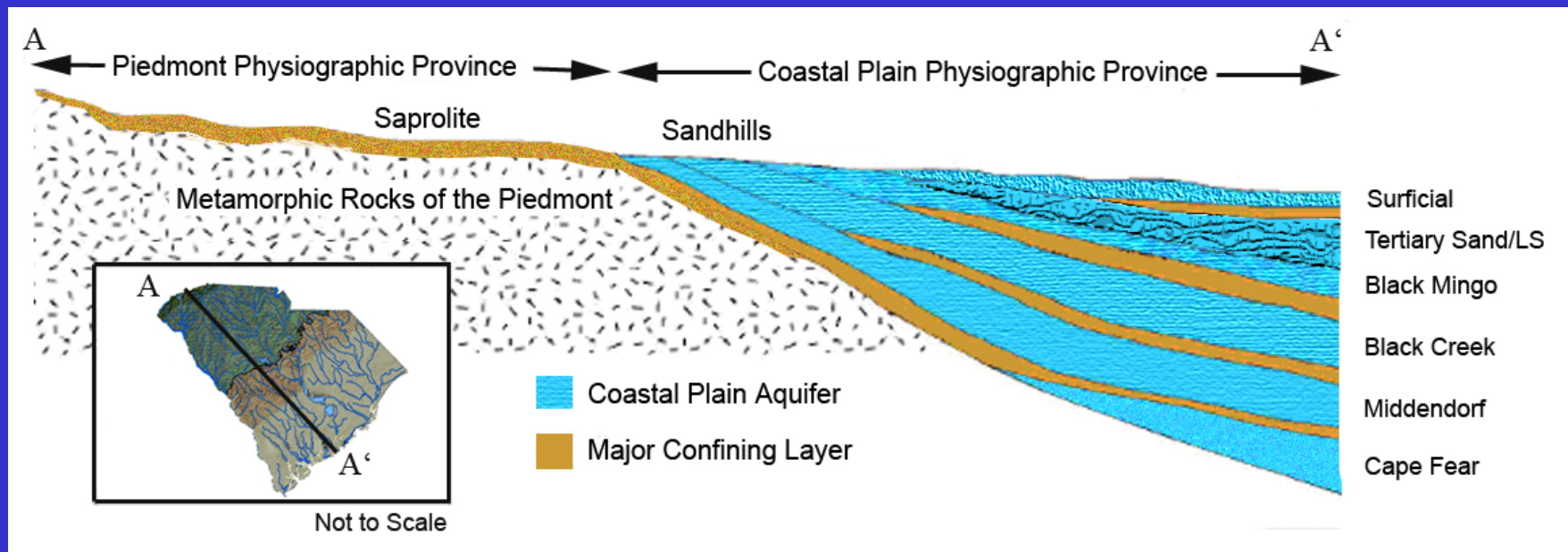
Groundwater Quality

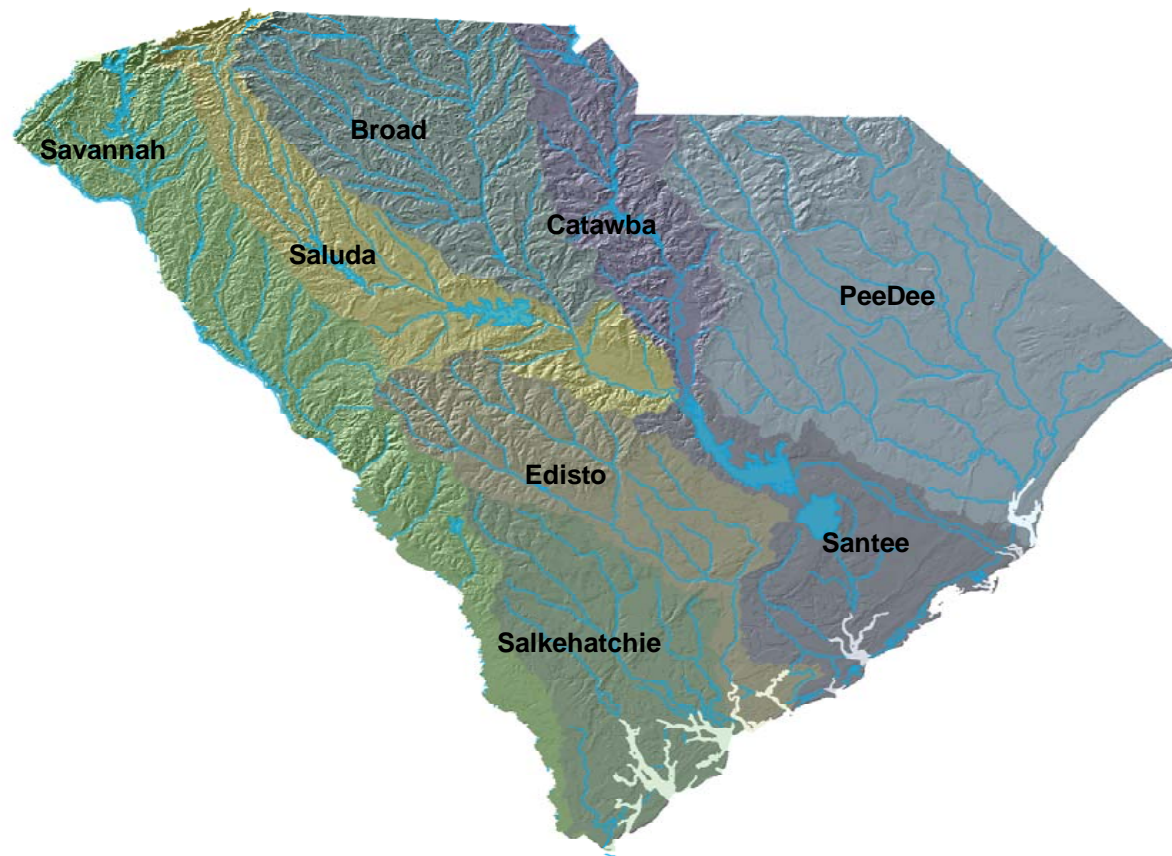
Ambient Groundwater Monitoring

The primary objective is to develop a baseline for ambient groundwater quality for South Carolina

- 1) To determine variations in regional groundwater quality.
- 2) To determine aquifer-specific variability in water quality.
- 3) To detect any significant changes in groundwater quality over time.

Generalized hydrogeologic cross-section from the Blue Ridge through the Lower Coastal Plain in South Carolina





Implementation Schedule

Major basins and their scheduled sampling date

- 2003: **Pee Dee** (28 wells): Piedmont Bedrock, Middendorf, Tertiary Sands, Black Creek, Surficial Sands
- 2004: **Broad** (10 wells): Piedmont Bedrock and Saprolite
- 2005: **Savannah and Salkehatchie** (25 wells): Piedmont Bedrock, Saprolite, Middendorf, Pee Dee/Black Creek, Tertiary Limestone
- 2006: **Saluda and Edisto** (18 wells): Piedmont Bedrock, Saprolite, Middendorf, Black Mingo, Pee Dee, Tertiary Limestone, Surficial Sands
- 2007: **Catawba and Santee** (15 wells): Piedmont Bedrock, Middendorf, Black Creek, Black Mingo

Groundwater Parameters

nitrate + nitrite

hardness

chloride

sulfate

TDS

pH

alkalinity

fluoride

TOC

specific conductivity

aluminum

beryllium

boron

cobalt

strontium

mercury

molybdenum

TKN

silica

zinc

calcium

- magnesium
- sodium
- potassium
- arsenic
- barium
- copper
- iron
- lead
- manganese
- selenium
- silver
- tin
- uranium
- cadmium
- chromium
- nickel
- antimony
- lithium

Ambient Groundwater Quality Findings

Bedrock differs greatly within the Piedmont, so too does the composition of groundwater.

Coastal Plain downdip ion concentrations generally increase because water in the aquifer longer period of time

Source Water Protection

Protecting surface water and groundwater supplies

- Pollution prevention
- Identifying potential pollution sources
- Susceptibility analysis
- Contingency plans
- Community Involvement

Approaches for Promoting Drinking Water Source Protection

- For six or seven years, SCDHEC has encouraged system owners and operators to sign up for assistance in drinking water source protection planning on a system-by-system basis – a “tough sell”. Why?
 - ✓ Not a regulatory requirement – 1996 amendments to the SDWA only encourage DWSPP
 - ✓ Not funded per se – funding available but require extra effort
- SCDHEC now plans to promote:
 - Education and outreach to more grass-roots organizations
 - Regional approaches involving the COGs and planning commissions

Assistance Available from DHEC

SCDHEC staff is available to help you with:

- SCDHEC's GIS-based information on sources and PCS's including GPSing new sources and PCS's
- Local hydrogeological conditions and susceptibility analysis
- Process facilitation (planning, advertising and conducting meetings; research; interaction with regulatory programs)
- Hands-on plan preparation

Source Water – NPDES permits

